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INFLATABLE PRODUCT

This application is a continuation application of pending patent application having Serial No. 10/085,700 filed Feb. 26, 2002.

BACKGROUND OF INVENTION

Field of the Invention

The present invention relates to inflatable products, and more particularly, to inflatable furniture such as mattresses, chairs and the like, which are easily inflated and deflated.

Discussion of Related Art

Inflatable furniture such as air mattresses and chairs have enjoyed wide popularity for a number of reasons. When not is use, such inflatable products occupy a small area in relation to their inflated size and are thus easily stored and transported. When inflated, a piece of inflatable furniture provides its user with a high level of comfort as he or she is literally supported upon a cushion of air isolating him or her from an uncomfortable resting surface such as a floor or the uneven terrain often associated with outdoor excursions.

Although inflatable furniture is relatively inexpensive and enjoys the advantages recited above, such products have never gained universal acceptance by the consuming public and are not seen as entirely suitable replacements for conventional furniture. One of the primary reasons for this lack of universal acceptance is that inflatable furniture, at least to date, has not been capable of fast and efficient inflation while at the same time providing its user with a level, firm and stable supporting surface. This is because conventional inflatable furniture tends to be constructed such that all parts are in fluid communication which results in a characteristic "give" caused by the redistribution of fluid which occurs when the user applies a downward force on the furniture. Even though certain structural methods have been used to reduce this bulging effect, such as I-beam stabilization, such methods only partially address the bulging problem because fluid redistribution still occurs during use. When this redistribution occurs, the resultant bulging and compressing of the inflatable product can cause a loss of evenness and stability.

Attempts have been made to address this perceived shortcoming in several different ways. For example, U.S. Pat. No. 3,705,429 discloses an inflatable mattress which uses a plurality of individual inflatable beams, columns or chambers within an outer inflatable chamber. Each beam or chamber is separately inflatable and independent, having its own inlet/outlet port, without fluid communication between contiguous chambers. Although this design may prevent the redistribution of fluid between chambers during use, it has another shortcoming. Each independent chamber must be inflated and deflated through multiple inlet ports, thus the task of inflating and deflating the mattress can prove lengthy or tedious to the user.

Therefore, there is a need for an inflatable product that allows for fluid communication between contiguous chambers during inflation, thus allowing for easy inflation from a single inlet port, while at the same time maintaining product firmness and stability by preventing the bulging associated with the redistribution of fluid during use. The present invention accomplishes these goals and overcomes the inadequacies of the prior art.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide an inflatable product which characteristically maintains its firmness and stability while not being overly complex to produce and maintain.

A further object of the present invention is to provide an inflatable product that demonstrates a firmness and stability similar to that of conventional furniture.

It is a further object of this invention to provide an inflatable product that can be readily inflated and deflated.

Additional features and advantages of the invention will be set forth in the description which follows, and will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as in the drawings.

The present invention comprises an inflatable product having a plurality of chambers with at

least two of said chambers adjoining one another in whole or in part, at least one unidirectional valve connecting any pair of adjoining chambers, an inlet port through which fluid can be introduced into said product, and an exhaust port through which fluid can exit said inflatable product.

It is to be understood that the foregoing general description and the following detailed description are exemplary and intended to provide a further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

Figure 1 is a partial sectional view of the first embodiment of an inflatable mattress with adjoining inner and outer chambers having an interconnecting unidirectional valve.

Figure 2 is a cross-sectional view of a second embodiment of an inflatable mattress with stacked multiple chambers having an interconnecting unidirectional valve.

Figure 3 is a perspective view of a unidirectional valve suitable for use in the invention which is biased in a closed position by a spring.

Figure 4 is an exploded view of the unidirectional valve of Figure 3.

Figure 5 is a top plan view of the unidirectional valve of Figure 3.

Figure 6 is a cross-sectional view of the unidirectional valve of Figure 5 taken along line 6-6.

Figure 7 is a perspective view of the mounting boot for the unidirectional valve of figure 3.

DETAILED DESCRIPTION

Figure 1 illustrates the first embodiment of the present invention. In particular figure 1 illustrates a partial-sectional view of an inflatable mattress 100, which comprises an inner chamber 101 surrounded by an outer chamber 102. The outer chamber 102 is formed by the sealing or joining of the top layer 103 and bottom layer 105 to the outer wall 104 along an upper outer wall seam 106 and a lower outer wall seam 107. The inner chamber 101 is formed by sealing or joining the top layer 103 and bottom layer 105 to the inner wall 108 along an upper inner wall seam 109 and a lower

inner wall seam 110. A tube 111 allows for the introduction of fluid into the inner chamber 101. The tube 111 is sealed within the outer wall 104 at a circular seam 112 about the periphery of tube 111 and into the inner wall 108 by a second circular seam 113 about the periphery of tube 111.

In both the first and second embodiments the materials forming the walls, layers and tube comprise a flexible and resilient material such as polyvinyl chloride sheeting (or PVC), thermoplastic impregnated cloth or other materials known to one having ordinary skill in the art. The seals between the walls, layers and tube are formed using radio frequency (RF) sealing or other processes known to one having ordinary skill in the art.

According to the first embodiment of the inflatable mattress 100 shown in figure 1 the inner chamber 101 and outer chamber 102 are inflated through a single inlet port 114 of the tube 111 using an electro-mechanical pump 115 inserted into the edge of the tube 111. The pump can be affixed to the outer edge of the mattress for use as needed. Fluid is first introduced into the inner chamber 101 after which some fluid passes through an unidirectional valve 300 into the outer chamber 102. Once the inner chamber 101 and outer chamber 102 are inflated, the unidirectional valve 300 prevents the reverse flow of fluid from the outer chamber 102 back into the inner chamber 101, as could occur for a number of reasons such as by the application of force by a user's body on the mattress.

The air pressure in the inner chamber 101 can be adjusted through a deflation valve contained in the electro-mechanical pump 115. In such usage when air is released from the inner chamber 101, air pressure in the outer chamber 102 remains constant as the unidirectional valve 300 prevents the back flow of air from the outer chamber 102 into the inner chamber 101. Thus differentiated pressures can be maintained in the inner and outer chambers.

Deflation of the entire air mattress 100 can be accomplished by the opening of the exhaust port 116 which is sealed within the outer wall 104. When the exhaust port 116 is opened, the pressure in the outer chamber will decrease. The resulting air pressure change will cause the unidirectional valve 300 to open allowing the passage of air from the inner chamber 101 into the outer chamber 102 and out the exhaust port 116.

Figure 2 represents a second embodiment of the invention. Particularly figure 2 represents a cross-sectional view of an inflatable mattress 200 wherein the multiple chambers of the air mattress 200 are comprised of an upper chamber 201 and a lower chamber 202. The upper chamber 201 and lower chamber 202 are formed by first sealing a top layer 203 to an upper side wall 206 along a seam 209. Next the middle layer 204 is sealed to both the upper side wall 206 and the lower side wall 207 along a seam 210. Finally, the bottom layer 205 is sealed to the lower side wall 207 along a seam 211. In addition, a tubular chamber 208 acts as a base preventing lateral movement the mattress 200, and is in fluid communication with the lower chamber 202.

The air mattress 200 can be inflated by introducing fluid through the inlet port 212 using an electro-mechanical pump 213 attached to the upper chamber 201. As fluid is introduced, it will pass into the upper chamber 201 through the unidirectional valve 300 into the lower chamber 202 and the tubular chamber 208. As with the first embodiment, when all chambers are filled the unidirectional valve 300 will prevent the reverse flow of fluid from the lower chamber 202 into the upper chamber 201.

The upper chamber 201 of the air mattress 200 can also be partially deflated by a valve incorporated within the electro-mechanical pump 213. As in the first embodiment the partial deflation of the upper chamber 201 will not affect the air pressure of the lower chamber 202 due to the restriction of air flow by the unidirectional valve 300.

Deflation of the mattress 200 can be accomplished by the opening of the exhaust port 214 which is within the lower wall 207 resulting in the decrease of the pressure in the lower chamber. The decreased fluid pressure in the lower chamber 202 will allow for the opening of the unidirectional valve 300 which in turn will allow for the passage of the fluid in the upper chamber 201 to pass through to the lower chamber 202 and finally through the exhaust port 214.

Figures 3-7 depict a valve suitable for use in the present invention, a spring loaded unidirectional valve. The valve comprises a movable valve element 301 and gasket 302. The gasket can be made of rubber or other suitable gasket material known to those having ordinary skill

in the art. The movable valve element 301 is biased in a closed position against the valve seat 311 by a partially compressed resilient coil spring 303. The spring 303 is held in place about the shaft 305 of the movable valve element 301by a retaining washer 304 affixed to said shaft.

The movable valve element 301 will move vertically with respect to the valve seat 311 through the central sleeve 306 thereby opening the unidirectional valve 300 when sufficient pressure is exerted on the movable valve element 301 to overcome the biasing tension created by the partially compressed spring 303.

The central sleeve 306 is an integral part of the valve body 307 and is attached to the valve body 307 by three triangular shaped support arms 308 which are integral with both the central sleeve 306 and the valve body 307.

In the first embodiment, the unidirectional valve 300 is mounted within the air mattress 100 such that it permits the unidirectional flow of air between the inner chamber 101 and the outer chamber 102. The mounting is accomplished by attaching a standard mounting boot 400, as shown in figure 7, approximately midway between the upper layer 103 and the lower layer 105 in the inner wall 108. The mounting boot has a male-threaded portion 401 capable of being received by the complementary female thread 312 of the unidirectional valve 300. The male threaded portion of said mounting boot is sealed to the inner wall 108 forming a seal 402 tight enough to prevent fluid leakage.

Once the valve is attached to the inner wall 108 the inlet side of the valve 309 will be in communication with the inner chamber 101 while the outlet side of the valve 310 will be in communication with the outer chamber 102.

In the second embodiment, the unidirectional valve 300 is mounted in the same manner as in the first embodiment except that the unidirectional valve 300 is mounted in between the upper chamber 201 and the lower chamber 202. Thus, the inlet side of the valve 309 will be in communication with the upper chamber 201 and the outlet side of the valve 310 will be in communication with the lower chamber 202.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing form the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.